

Novel Solar Cell Nanotechnology for Improved Efficiency and Radiation Hardness, Phase II

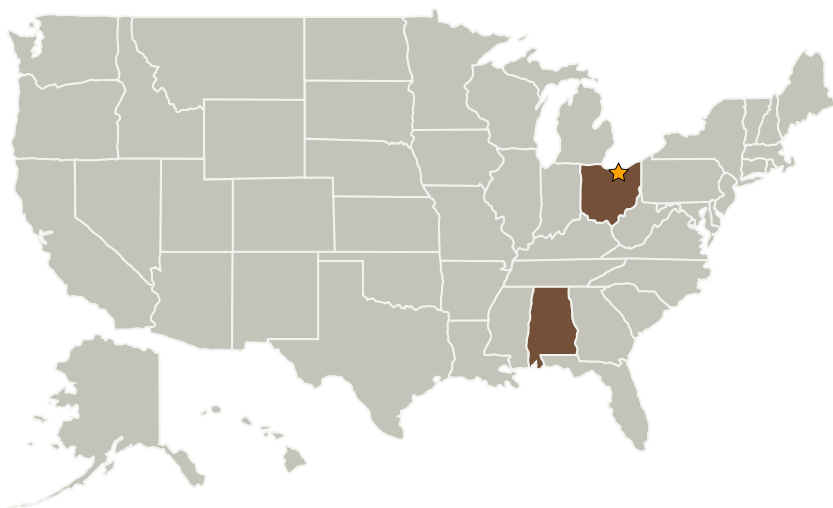
Completed Technology Project (2006 - 2008)



Project Introduction

Significant improvements in photovoltaic materials and systems are required to enable NASA future exploration missions. In this project, CFD Research Corporation (CFDRC) with University of California Riverside (UCR), Rochester Institute of Technology, and International Photonics will: 1) develop and provide reliable, validated computational tools for assessment, design, and optimization of novel nanostructures based on Quantum Dots (QD) for future nano-devices for space applications; 2) investigate, design, and demonstrate new photovoltaic (PV) structures based on QD nanotechnology, with improved efficiency and radiation hardness. The inherently radiation tolerant quantum dots of variable sizes maximize absorption of different light wavelengths ("multicolor" cell), which dramatically improves photovoltaic efficiency and diminishes the radiation-induced degradation. Phase 1 included development of numerical tools for modeling electron-phonon transport in quantum-dot for photovoltaic applications, using experimental data from UCR Nano-Device Laboratory for validation and calibration of the models, computational and experimental proof-of-concept. In Phase 2, the new QD models will be integrated into CFDRC's advanced photonic-electronic device simulator and used for further optimization of QD superlattices. Novel QD photovoltaic nano-engineered materials and designs will be down-selected for further development to the point of testable prototypes. They will be fabricated and demonstrated by detailed electrical characterization and radiation testing.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
CFD Research Corporation	Supporting Organization	Industry	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Ohio

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX02 Flight Computing and Avionics
 - └ TX02.3 Avionics Tools, Models, and Analysis
 - └ TX02.3.2 Space Radiation Analysis and Modeling